CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Daniel G. Kalfayan

Project Number

J0509

Project Title

Vitamin C in Foods: Can It Take the Heat?

Abstract

Objectives/Goals

Reports published by the U.S. National Institute of Health indicate a food's vitamin C oxidizes and denatures at 70° C (or 158° F). I set out to learn if vitamin C could be completely oxidized at normal cooking temperatures. How much vitamin C is lost when fruits such as oranges and tomatoes, and vegetables such as bell peppers and broccoli are cooked at different temperatures? I believed the higher the temperature, the more vitamin C will be lost. If vitamin C is denatured at 158° F, then I thought 50% of the vitamin C would be lost when the food temperature reached 79° F (or 50% of 158° F). I also believed 75% of the vitamin C would be lost when the food temperature reached 119° F (or 75% of 158° F). Finally, I thought all of the food's vitamin C would be denatured when the food's temperature reached 158° F.

Methods/Materials

I cooked oranges, tomatoes, bell peppers and broccoli at various temperatures in order to test my hypothesis. The effect of heat on the vitamin C for these four foods was determined by redox titration, using household iodine and a starch indicator solution.

Results

According to my redox titration, the concentration of vitamin C in each of the four foods was not significantly affected (by more than 5%) until the temperature of the cooked foods reached a minimum 158° F. Virtually no vitamin C was lost at an average 79° and 119° F for any of the foods.

Conclusions/Discussion

Based on my research, I proved the higher the temperature, the more the denaturing of vitamin C but I also proved that vitamin C begins denaturing (not finishes denaturing) when a food reaches 158° F. Therefore, my research disproved the second part of my hypothesis that the vitamin C in foods would be 50% and 75% denatured at 79° and 119° F, respectively. Vitamin C will not significantly begin the denaturing and oxidization process until the average temperature of the food reaches at least 158° F. I learned that in order to maximize the natural vitamin C in raw foods, it's important to cook them as quickly as possible with the lowest amount of heat.

Summary Statement

My science project was dedicated to understanding the healthiest way to eat and cook fruits and vegetables.

Help Received

My mother helped me perform redox titration with iodine.